

AMENDMENTS TO THE DRAWINGS

Applicants have attached revised drawings ("Replacement Sheet 4/6") for the Examiner's approval. In Replacement Sheet 4/6, Figure 7 has been amended to include reference numeral 24. Revised, new Figure 7 more clearly illustrates the inventive aspects of Applicants' claimed invention. The attached Replacement Sheet 4/6, which includes Figures 7-10, replaces the original sheet 4/6 including Figures 7-10. No new matter has been added.

Attachment: Replacement Sheet 4/6

REMARKS

Claims 1 and 9-16 remain pending in the application. Reconsideration of the rejections set forth in the aforementioned Office Action is respectfully requested in view of the above amendments and following remarks. The basis for these amendments can be found throughout the specification, claims and drawings as originally filed. Additionally, Applicants respectfully submit that no new issues of patentability have been raised by the above amendments.

OBJECTION TO THE CLAIMS

Claim 11 stands objected to for certain "informalities". Applicants have amended Claim 11 so as to correct the informality noted by the Examiner. Accordingly, Applicants respectfully request that the Examiner enter this amendment, and reconsider and withdraw her objection to Claim 11.

CLAIM REJECTION UNDER 35 U.S.C. § 102

Claims 9, 12 and 13 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Shibuya, U.S. Patent No. 5,758,541. Applicants respectfully traverse this rejection.

The Examiner alleges that Shibuya "discloses a shaft (for example) 3 having plural rounded bumps 14 on a seal area (of 13). The shaft has a gear journal 2 and bearing journal." Applicants respectfully disagree with the Examiner's characterization that Shibuya anticipates the present invention.

Applicants submit that the Shibuya reference discloses small protrusions on the oil seal itself, i.e. the elastic element is formed with a plurality of small protrusions. The

protrusions are molded on the elastomer oil seal, and are subject to elastic deformation and premature wear.

In contradistinction, Applicants' claimed invention provides rounded bumps on the metallic shaft's oil seal journal which do not deform under the pressure of the oil seal and exhibit minimal wear. In this regard, independent Claim 9 recites "a plurality of rounded bumps on the seal journal, so as to promote hydrodynamic lubrication". Shibuya, alone or in combination with any of the other references cited, does not disclose, teach or suggest any similar structure such as a shaft having "a plurality of rounded bumps on the seal journal, so as to promote hydrodynamic lubrication" as recited in independent Claim 9 of Applicants' claimed invention. There is no motivation or incentive in Shibuya, alone or in combination with any of the other references cited, to arrive at Applicants' invention as claimed.

Therefore, independent Claim 9 should be in condition for allowance. Further, because Claims 12 and 13 depend from Claim 9, they are at least as limited, are similarly not taught by Shibuya, and should also be in condition for allowance. In view of the above amendments and these remarks, Applicants respectfully request the Examiner to reconsider and withdraw the Section 102 rejection to Claims 9, 12 and 13.

CLAIM REJECTIONS UNDER 35 U.S.C. § 103

Claims 9-12 and 14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Otto, U.S. Patent No. 3,586,340 in view of Klink, U.S. Patent No. 5,630,953. Applicants respectfully traverse this rejection.

The Examiner alleges that Otto “discloses a seal 8 disposed between a shaft and an aperture of a wall (not shown). The shaft has a seal area 6 with a plurality of bumps 24. The top of the bumps is flat, i.e. not rounded. Klink teaches a surface using bumps to form a lubricant reservoir. Klink teaches various art equivalent shapes of the bumps including flat and rounded (see Figs. 4a-c). Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the bump with a rounded surface as such is an art equivalent as taught by Klink.” Applicants respectfully disagree with the Examiner’s characterization that Otto, alone or in combination with Klink or any of the other references cited, renders Applicants’ claimed invention obvious.

Applicants submit that the Otto reference discloses a working surface composed of a multiplicity of triangular asperities arranged in a simple geometric array. The sidewalls of the asperities serve as pump impellers for pumping lubricant. The Klink reference discloses a method for fine machining bore walls in cylinders of internal combustion engines for lubrication purposes. Additionally, the Klink reference discloses channels of different shapes and configurations that allow oil to pass for the sole purpose of lubricating such internal combustion engine cylinders. Applicants respectfully submit that the above described surface texture will not seal oil.

Applicants’ claimed invention includes a shaft having a seal area including a seal journal with a plurality of spherical bumps positioned thereon. The spherical bumps present no sharp edges to the seal and the depressions between the bumps serve to retain lubricant, thereby promoting hydrodynamic lubrication, reducing energy losses due to friction, and reducing or eliminating wear on the seal and the shaft. Specifically in this regard, independent Claim 9 recites a shaft having “a seal area including a seal journal;

and a plurality of rounded bumps on the seal journal, so as to promote hydrodynamic lubrication.” Similarly, independent Claim 14 recites a wall and shaft assembly having “a seal area including a seal journal with a plurality of rounded bumps so as to promote hydrodynamic lubrication”. Otto, alone or in combination with Klink or any of the other references cited, does not disclose, teach or suggest any similar structure such as a shaft, or a wall and shaft assembly having a seal journal including a plurality of rounded bumps formed thereon so as to promote hydrodynamic lubrication as recited in independent Claims 9 and 14 of Applicants’ claimed invention. There is no motivation or incentive in Otto, alone or in combination with Klink or any of the other references cited, to arrive at Applicants’ invention as claimed.

Therefore, independent Claims 9 and 14 should be in condition for allowance. Further, because Claims 10-12 depend from Claim 9, they are at least as limited, are similarly not taught by Otto, alone or in combination with Klink or any of the other references cited, and should also be in condition for allowance. In view of the above amendments and these remarks, Applicants respectfully request the Examiner to reconsider and withdraw the Section 103 rejection to Claims 9-12 and 14.

Claims 1 and 9-16 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Polzin, U.S. Patent No. 3,348,430 in view of Otto, U.S. Patent No. 3,586,340 in view of Klink, U.S. Patent No. 5,630,953. Applicants respectfully traverse this rejection.

Claims 9-11 and 14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Grorich, U.S. Patent No. 3,973,781 in view of Weinand, U.S. Patent No. 3,554,561 in view of Klink, U.S. Patent No. 5,630,953. Applicants respectfully traverse this rejection.

For the sake of brevity, it is respectfully submitted that in view of Applicants' arguments stated above, Shibuya and Otto are improper primary references, Otto and Klink are improper secondary references, and Applicants' claims are patentably distinct with respect thereto, as well as no teaching in existence to suggest the combination of the references.

Applicants respectfully disagree with the Examiner's characterization that Polzin in view of Otto in view of Klink, and Gorich in view of Weinand in view of Klink render Applicants' claimed invention obvious. With respect to these references, Applicants make the following observations. The Polzin reference discloses a standard oil seal including a standard oil seal journal. The Gorich reference discloses protrusions which are not on the shaft and have flat contact surfaces with sharply angled top edges. See col. 11, lines 33-43. In this regard, Gorich further discloses an oil seal journal surface being substantially smooth and the oil seal being formed with an array of closely spaced geometrically similar projecting frustopyramids. These truncated pyramids are aligned and equally spaced, and are formed in the elastomer or rubber part of the oil seal. Lastly, the Weinand reference discloses a surface having a plurality of circumferentially aligned generally V-shaped grooves to impart an unidirectional pumping action to a fluid.

As explained above, Applicants' claimed invention provides a shaft having a seal area including a seal journal with a plurality of randomly spaced spherical bumps positioned thereon. The bumps present no sharp edges to the seal and the depressions between the bumps serve to retain lubricant, thereby promoting hydrodynamic lubrication, reducing energy losses due to friction, and reducing or eliminating wear on the seal and the shaft. Accordingly, hydrodynamic lubrication is achieved between the oil seal journal

and the oil seal lip. Specifically in this regard, independent Claim 1 recites a speed reducer having “an input shaft having at least one seal area including a seal journal with a plurality of rounded bumps” and “an output shaft having at least one output seal area including a seal journal having a plurality of rounded bumps”. Similarly, independent Claim 9 recites a shaft having “a seal area including a seal journal; and a plurality of rounded bumps on the seal journal, so as to promote hydrodynamic lubrication.” Finally, independent Claim 14 recites a wall and shaft assembly having “a seal area including a seal journal with a plurality of rounded bumps so as to promote hydrodynamic lubrication”. Accordingly, Polzin and Grorich, alone or in combination with Otto, Klink and/or Weinand, or with any of the other references cited, does not disclose, teach or suggest any similar structure as a speed reducer, a shaft, or a wall and shaft assembly having a seal journal including a plurality of rounded bumps formed thereon so as to promote hydrodynamic lubrication as recited in independent Claims 1, 9 and 14 of Applicants’ claimed invention. There is no motivation or incentive in Polzin or Grorich, alone or in combination with Otto, Klink and/or Weinand, or with any of the other references cited, to arrive at Applicants’ invention as claimed. Moreover, the Examiner has failed to identify any motivation by one of ordinary skill in the art to combine or modify the art to arrive at the claimed invention other than the impermissible use of hindsight. Obviousness is not established by combining the teachings of the prior art absent some teaching, suggestion or incentive supporting such combination.

Therefore, independent Claims 1, 9 and 14 should be in condition for allowance. Further, because Claims 10-13 and 15-16 depend from Claims 9 and 14, respectively, they are at least as limited, are similarly not taught by Polzin and Grorich, alone or in

combination with Otto, Klink and/or Weinand, or with any of the other references cited, and should also be in condition for allowance. In view of the above amendments and these remarks, Applicants respectfully request the Examiner to reconsider and withdraw the Section 103 rejections to Claims 1 and 9-16.

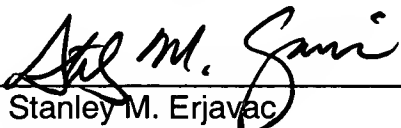
CONCLUSION

Applicants respectfully submit that the above amendments require only a cursory review by the Examiner and place the application in a better form for appeal. Moreover, no new issues of patentability have been raised.

All of the stated grounds of rejection have been properly traversed, accommodated or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently outstanding rejections and that they be withdrawn. It is believed that a full and complete response has been made to the outstanding Office Action, and as such, the present application is in condition for allowance. If the Examiner believes that personal communication will expedite prosecution of this application, she is invited to contact the undersigned at her earliest convenience.

Respectfully submitted,
HARNESS, DICKEY & PIERCE, P.L.C.
Attorneys for Applicants

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By: 
Stanley M. Erjavac
Reg. No. 38,442

P.O. Box 828
Bloomfield Hills, Michigan 48303
(248) 641-1600

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